

The benefits of automation

Where relatively small batch sizes require frequent machine re-setting, the purchase of a new production machine should not only focus on its processing speed, but also on reducing the idle time that occurs when it is being reset to manufacture a new product.

An important part of reducing this idle time is the logistics of supplying raw material to the machine, and removing the components after manufacture. Southampton-based Kasto (Tel: 01489 772882) is one company that has addressed this requirement with its development of a number of space-saving modular systems that allow sheet-metal finished parts and other goods to be stored and subsequently delivered automatically to workstations. Moreover, the company co-operates with many of the leading sheet-metal machine tool manufacturers — including Trumpf, Salvagnini and Bystronic — to provide interfaces between their machines and its storage systems.

Sheet-metal-processing facilities are investing more and more in such automated storage and retrieval systems, to streamline stock control and material flow through their operations. In this way, uninterrupted supply to machine tools can be maintained 24/7, and orders fulfilled promptly; at the same time, users of automated systems can store a larger amount of stock in a given footprint, saving valuable floor space compared with conventional racking systems.

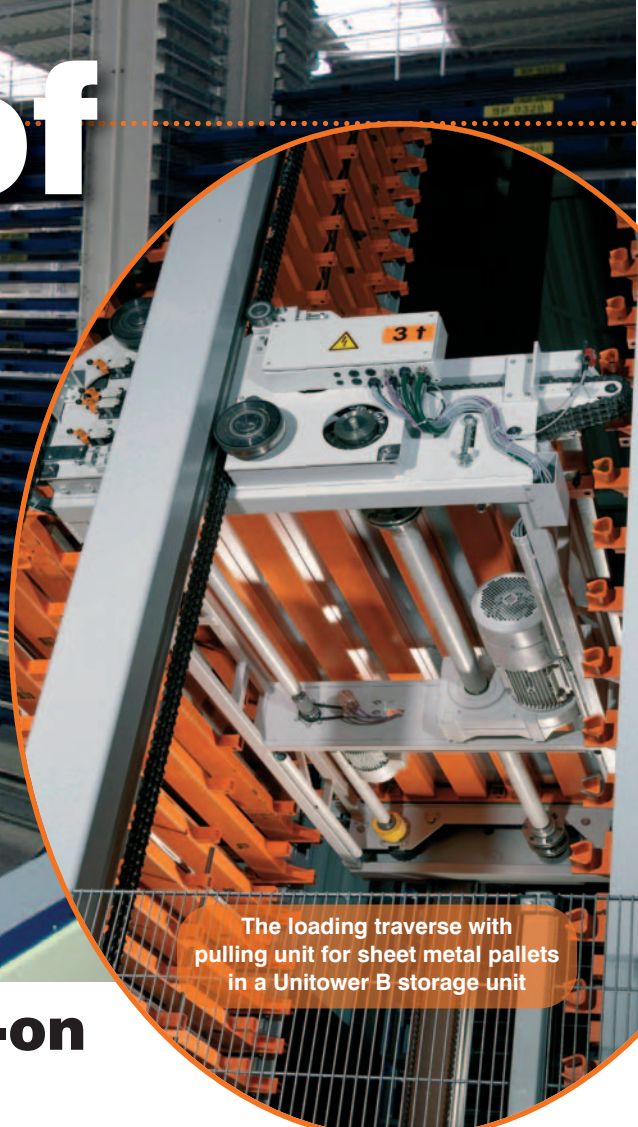
For medium-size volumes requiring approximately 200-800 storage locations and up to 30 automatic picks per hr, Kasto offers its automated Uniline — a single- or double-sided system for single-deep storage. The gantry crane — a double-mast unit with the handling equipment moving up and down between the masts — is equipped with proven pull/push technology, which moves the system pallet via a precision roller chain and carriers fastened on the chain. Special plastic tracks/glideways accept the pallet in the shelf block and on the handling stations. Two precision roller chains provide the lift movement, which is synchronised with the drive and control for the gantry crane so that only one drive moves at maximum speed, the other travelling only as fast as necessary, thereby saving power. Deceleration is calculated to ensure pin-point accuracy on arrival at the designated storage location.

Furthermore, the storage locations and gantry crane are equipped with sensors to monitor the height of the load. With this information, the system's inventory-control computer searches for a location to store the loaded pallet so that as little space as possible remains unused above the load. Alternatively, stations can be equipped with weighing cells; this is preferred in distribution centres.

Smaller sheet-metal-storage requirements are met by Kasto's Unitower C sheet metal tower, in which the material is removed manually, and Unitower B single- or double-sided, automatic sheet-metal-storage units. These have a large storage-to-footprint ratio and can be up to 20m high. There can be a maximum of 100 storage locations, each capable of accepting loads up to



One of Kasto's Uniline stores with four Trumpf flat-bed lasers connected by loading and unloading carts



The loading traverse with pulling unit for sheet metal pallets in a Unitower B storage unit

The increases in efficiency and laser beam-on time can be 'like having another machine'

five tonnes. Long stock such as flats and bar — as well as pallets — can be handled and stored in addition to sheet. Moreover, towers can be designed with wall and roof cladding, to allow them to be located externally, saving valuable factory space; and in facilities with production on more than one level, it is possible to have storage and removal stations on all floors.

For larger sheet metal storage requirements, Kasto offers its 'honeycomb' Unicompact systems range, which offers the possibility of thousands of locations. These automatic, high-performance cassette systems offer high storage density, synchronous vertical and horizontal movement of the gantry crane and optimised, intelligent storage according to whether the stock is fast-, medium- or slow-moving.

Cassette removal and replacement of the previously picked cassette is carried out in one sequence, and stock can be output to various discharge points or commissioning tables, thereby serving multiple sheet-processing stations. The double-deep storage of cassettes is an option, according to storage density and speed of pick required.

These systems are built to heights of between 4 and 26m and for cassettes with a capacity of up to 8 tonnes each. The storage volume is between 500 and 4,000 cassettes, and up to 60 cycles per hr are possible. Moreover, because these systems are based on a modular design, alterations to the size of the store and to the handling equipment can be made at a future date.

Material supply

The objective is continuous material supply and replenishment of the stock when it has been

used up. Buffer locations close to the workstation guarantee short change-over times from one pallet of sheet to the next; they also facilitate and speed up the movement of machined components back into storage or transport to the next processing operation. Important here is the design of the interface between the areas storing the material and the processing machines, to guarantee safe operation and easy access for sheet handling. A 'pin table' allows stacked

sheet metal to be positioned if a lift truck or crane has picked the material off a wooden pallet. To guarantee accurate positioning and to achieve safe, unmanned interaction with sheet-metal-processing machines, the receiving stations are equipped with positioning bolts.

An automated sheet-metal-storage system can be connected directly to one or several sheet-metal-processing machines. In the latter case, the operating gantry fulfils several tasks:

storage of raw material, supply of the raw material to the first machine tool, and return and buffer storage of semi-finished parts to make them available to the second machine. Finished parts may go back into storage again or be sent straight to despatch or on to the next manufacturing process. Most logistical functions are within the storage system and lift-truck traffic or other manual handling in the manufactur-

ing area is hardly needed. The spectrum of machines that can be automated in this way is wide and supplier-independent. Equipment can include turret punch presses, laser and plasma profiling machines and water-jet cutting machines, as well as secondary sheet-processing machines such as press brakes and folders.

When machines and storage are linked in this way, the operator's function is to control and oversee the production cell, which produces parts automatically. Long periods of unattended running are possible. Manual stations are only used where nested parts have to be sorted by hand, where manual deburring is needed or where non-integrated machines have to be loaded.

Inventory control

Complex, automatic sheet metal processing puts stringent demands on the inventory control software, which has to make sure that the right material is delivered to the correct location at the right time. The Kasto-LVR processes all of the data and generates orders for the gantry crane and stations. When material enters or leaves the storage system, inventory data is stored against that system pallet. The result is automatic inventory control, provided that only identical material types, sizes and qualities are stored on the same pallet.

The Kasto-LVR is a modular control system that can, if necessary, co-ordinate the operation of several storage systems. Management of, for example, storage areas where lift trucks are used is possible by programming the inclusion of an external storage area — and Kasto-LVR can be linked upstream with a host computer and downstream with machine tools and other processing machines. It can also be interfaced to the customer's enterprise resource planning system, facilitating automatic order download to the control; and where sheet-metal-working machines are concerned, jobs can be combined by nesting them together on sheets of the same type and gauge of material.

Material availability can be checked while programming is carried out, and stock can be reserved for specific orders. Data is sent to the inventory control system, where the manufacturing order, the appropriate material location and the appropriate nesting program are combined. As soon as the machine is ready, the inventory-control computer starts the material delivery and transfers the program and order information to the machine via a machine-specific interface. If semi-finished parts are returned to the store, their details are transferred to the control as well. This data can be transmitted simultaneously to another machine which will finish the order.

Automated systems offer increased productivity, efficiency and competitiveness. Further benefits include operator safety, less risk of damage to material and products, permanent inventory control, a clear allocation of material cost and production time estimation. The final — and perhaps most important — advantage of using an automated sheet metal manufacturing system is the speed of order turn-round.

Machine supplier's view of automation

Stephen Rolfe, UK and Ireland sales manager for Bystronic UK Ltd, Leeds (Tel: 0844 848 5850), says that machines such as laser profilers stand idle for two main reasons: the fact that no programs are available, and the fact that no material is available or ready to be processed. Indeed, he says that these two factors account for some 75% of machine down-time.

"Another problem is that machines get 'corralled' by finished parts; and while this is only one of many problems that automation can overcome, users often declare that 'automation is not for us'. They tend to think in 2-D and ignore the benefits of systems that work in 3-D — going up rather than going out — plus they reckon that tower-type storage systems are too costly and need high-volume production to make them pay.

"Users also have concerns about automation taking up too much space on the shopfloor, and they can be uncertain about how to calculate

their automation needs. However, the benefits of automation can be dramatic; a tower-type storage system can increase a laser's beam-on time from 45% to 80%, which is almost like having a second machine."

Bystronic offers a series of 'Needs Profiles' that allows potential users of automation to establish the type of equipment that will best satisfy their requirements. For example, for a user that requires flexible and fast job processing and needs to meet tight deadlines with planning horizons of less than two days, while processing small non-repeating jobs and accommodating frequent change requests, an automatic table loader (Bystronic's Byloader) will give a machine utilisation of better than 60%.

The company's Bytrans automatic table loader and unloader raises machine utilisation to better than 70% and accommodates production typified by medium-size and large jobs

that are generally produced on a repetitive basis, with a planning horizon that is typically greater than two days. This equipment satisfies the objectives of increasing machine utilisation and reducing the cost of labour by operating several machines with one operator.

At the top end of the automation scale, the Bycell is an automatic compact cell with a storage system that accommodates small, medium and large jobs, as well as repeat jobs and individual jobs with a planning horizon greater than two days. With this system, the material storage capability is large and needs to be integrated to satisfy high levels of production demand, machine utilisation and sheet yield. The goal is the central control of several machines by one operator and to have flexible night and weekend production with minimal manpower. The degree of machine utilisation with this automation typically exceeds 80%.